

## Mechanical/Automobile

**QP Code : 12540**

(3 Hours)

[Total Marks: 80]

- N.B:**
- (1) Question No. 1 is compulsory.
  - (2) Attempt any three questions from remaining five questions.
  - (3) Figures to the right indicate full marks
  - (4) Illustrate the answer with neat sketches wherever required.
  - (5) Answers to questions should be grouped & written together.

1. Write short note on any four of the following: (20)
  - a) Burgers vector
  - b) Creep Resistant Materials
  - c) Importance of Iron as engineering material
  - d) Maraging heat treatment process
  - e) Classification of alloying elements
  - f) Composite materials
2.
  - (a) Draw and explain Isomorphous and Eutectoid Phase diagrams. (8)
  - (b) Explain the process of dislocation generation by Frank Read source. (6)
  - (c) Explain Andrade's analysis of the classical creep curve. (6)
3.
  - (a) What is Surface hardening? Name its different methods. Discuss any one method in detail. (8)
  - (b) Draw a neat and labelled microstructure of White Cast Iron, Grey Cast Iron and Nodular Cast Iron. (6)
  - (c) What is Critical Resolved Shear Stress? Derive the expression for Critical Resolved Shear Stress for deformation by slip. (6)
4.
  - (a) Explain the stages of recrystallization annealing and factors affecting it. (8)
  - (b) Discuss the Subzero heat treatment of Steel. (6)
  - (c) What are the limitations of Plain Carbon Steel? Explain the effect of alloying elements on phase transformation. (6)
5.
  - (a) State Griffith's theory of brittle fracture and derive Griffith's equation. (8)
  - (b) Discuss the Full Annealing heat treatment of Steel. (6)
  - (c) Give classification on stainless steel. (6)
6.
  - (a) Draw neat Iron- Iron Carbide Equilibrium diagram indicating all important temperature, phases and composition. (8)
  - (b) Explain fatigue limit for ferrous and nonferrous alloys with the help of S-N diagram. (6)
  - (c) What are Nano Materials? Write a note on Nano Composites. (6)

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